SAFETY DATA SHEET

Product: Semiconducting Single-Wall Carbon nanotubes in aromatic solution

(1) PRODUCT AND COMPANY IDENTIFICATION

Product Description: IsoSol-S100. Ultra high-purity (>99.9%), polymer-wrapped semiconducting single-walled carbon nanotubes in aromatic solution.

Use of the substance/Preparation: For laboratory research and commercial development purposes only.

Manufacturer:
NanoIntegris Technologies, Inc.,
c/o Raymor Industries Inc.
3765 La Vérendrye
Boisbriand, Quebec, J7H 1R8
CANADA
Phone No.: +1 450.434.6266

Emergency Telephone: 1-888-CANUTEC (226-8832) (North American use) and/or
1-613-996-6666 (International use)

(2) HAZARDS IDENTIFICATION (EC)

Emergency Overview:
May be harmful if swallowed. Avoid eye contact.

Target Organs:
Bladder, Liver, Kidney, Brain

GHS Classification
Flammable liquids (Category 2)
Skin irritation (Category 2)
Reproductive toxicity (Category 2)
Specific target organ toxicity - single exposure (Category 3), Central nervous system
Specific target organ toxicity - repeated exposure (Category 2) Aspiration hazard (Category 1)
Acute aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Signal Word: Danger

Hazard statement(s)
H225 Highly flammable liquid and vapor.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H361 Suspected of damaging fertility or the unborn child
H373 May cause damage to organs through prolonged or repeated exposure.
H401 Toxic to aquatic life.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. -No smoking.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P281 Use personal protective equipment as required.
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331 Do NOT induce vomiting.

(3) COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT	CAS NUMBER	CONCENTRATION
carbon nanotubes	308068-56-6	< 0.1 %
Toluene	108-88-3	>98.9%
Proprietary Polyfluorene Copolymer	248256-53-3	<0.05 %
Mixture of Nickel and	7440-02-0	<0.0005 %
Iron and	7439-89-6	
Cobalt	7440-48-4	

(4) FIRST AID MEASURES

Eye contact: Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention of irritation persists.

Skin contact: Wash with soap and water. If irritation develops and persists, get medical attention.

Inhalation (Breathing): If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.

Ingestion (Swallowed): Do NOT induce vomiting. Call local physician or poison control center.

(5) FIRE-FIGHTING MEASURES

Conditions of flammability:	Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.
Suitable extinguishing media:	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Special protective equipment for fire-fighters:	Wear self-contained breathing apparatus for firefighting if necessary.
Hazardous combustion products:	Hazardous decomposition products formed under fire conditions - Carbon oxides.
Explosion data - sensitivity to mechanical:	No data available
Explosion data - sensitivity to static discharge:	No data available
Further information:	Use water spray to cool unopened containers

(6) ACCIDENTAL RELEASE MEASURES

Personal precautions:	Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
Environmental precautions:	Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
Methods and materials for containment and cleaning up:	Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

(7) HANDLING AND STORAGE

Handling:	Minimize breathing of vapors and avoid prolonged or repeated contact with skin. Wear proper protective equipment. If ventilation is not efficient, wear proper respiratory equipment. Detailed information on handling carbon nanotubes may be found at the ASTM Standard E 2535-07, “Standard Guide for Handling Unbound Engineer Nanoscale Particles in Occupational Settings,” ASTM International, www.astm.org.
Storage:	Store in cool, dry, well-ventilated area away from all sources of ignition. “Empty” containers may retain product residue and can be hazardous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Waste Disposal Method:	Follow applicable Federal, state, and local regulations. A qualified environmental professional should determine waste characterization, disposal, and treatment

methods.

(8) EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical	Occupational Exposure Limits
Toluene	20 ppm TWA (USA. ACGIH Threshold Limit Values (TLV) 20 ppm TWA (Canada. British Columbia OEL) 50 ppm & 188 mg/m3 TWA (Canada. Alberta, Occupational Health and Safety Code (table 2: OEL) 50 ppm & 188 mg/m3 TWAEV (Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants) 20 ppm TWAEV (Canada. Ontario OELS's) Visual impairment. Female reproductive Pregnancy loss 2010 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section). Not classifiable as a human carcinogen
Dry carbon nanotubes:	NIOSH Exposure Limit Value : 0.01 mg/m^3 (ACGIH) OSHA (PEL): No occupational limits established. German Maximale Arbeitsplatzkonzentration (MAK) : 6 mg/m^3 British Occupational Exposure Limit (OEL) : 3.5 mg/m^3 Italian Exposure Limit: 3.5 mg/m^3 TWA; * 7 mg/m^3 STEL** NEDO Project "Research and Development of Nanoparticle Characterization Methods" : 0.03 mg/m^3 (based on a 4 week test with full-body inhalation by Nakanishi et al., 2011). * Time-weighted average ** Short-term exposure limit

The following Controls are recommended for Normal Consumer Use of this product

Engineering Controls:	Use in a well-ventilated area. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Section 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Personal Protection:	
Eye Protection	Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.
Skin Protection:	Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely.
Respiratory Protection:	None needed for normal use with adequate ventilation.
Hand protection:	Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. Full contact Material: Fluorinated rubber Minimum layer thickness: 0.7 mm Break through time: 480 min Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M) Splash contact Material: Fluorinated rubber Minimum layer thickness: 0.7 mm Break through time: 480 min Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374 If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

For Bulk Processing or Workplace Use the Following Recommended Controls:

Engineering Controls:	Use adequate general and local exhaust ventilation to maintain exposure levels below that of occupational exposure limits.
Personal Protection:	
Eye Protection	Safety goggles recommended where eye contact is possible.
Skin Protection:	Wear chemical resistant gloves.
Protective Clothing equipment:	Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye and face- protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with, contact lenses.
Respiratory Protection:	None required if ventilation is adequate. Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.
Work/ Hygiene Practices:	Wash with soap and water after handling.

(9) PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form:	Liquid
Colour:	Dark Brown
Solubility in Water:	Limited Solubility. No data available
Odor:	Aromatic
Boiling Point:	110-111 °C (230 - 232 °F)
Melting point/freezing point:	-93 °C (-135 °F)
Flash point:	4.0 °C – closed cup
Vapor Pressure:	29.1 hPa (21.8 mmHg) at 20 °C
Ignition temperature:	535 °C (995 °F)
Auto-ignition temperature:	535.0 °C (995.0 °F)
Lower explosion limit:	1.2 %(V)
Upper explosion limit:	7 %(V)
Density:	0.865 g/mL at 25 °C (77 °F)

(10) STABILITY AND REACTIVITY

Stability:	Stable
Hazardous Polimerization:	Will not occur.
Conditions to Avoid:	Heat, sparks, flames, and other sources of ignition. Extremely cold temperatures.

	Do not puncture or incinerate storage container.
Incompatibilities:	Strong oxidizing agents.
Hazardous Decomposition Products:	Hazardous decomposition products formed under fire conditions. - Carbon oxides. Other decomposition products - no data available.

(11) TOXICOLOGICAL INFORMATION

Acute toxicity (toluene):	Oral LD50 LD50 Oral - rat - > 5,580 mg/kg Inhalation LC50 LC50 Inhalation - rat - 4 h - 12,500 - 28,800 mg/m3 Dermal LD50 LD50 Dermal - rabbit - 12,196 mg/kg Other information on acute toxicity no data available
Skin Toxicity (toluene)	Skin corrosion/irritation Skin - rabbit - Skin irritation - 24 h Serious eye damage/eye irritation no data available Respiratory or skin sensitisation no data available
Germ cell mutagenicity (toluene):	Genotoxicity in vitro - rat - Liver DNA damage
Carcinogenicity (toluene):	IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
Reproductive toxicity (toluene):	Reproductive toxicity - rat - Inhalation Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count). Experiments have shown reproductive toxicity effects in male and female laboratory animals.
Teratogenicity(toluene):	Developmental Toxicity - rat - Oral Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Damage to fetus possible Suspected human reproductive toxicant
Target Organ Toxicity (toluene):	Specific target organ toxicity - single exposure (Globally Harmonized System) no data available Specific target organ toxicity - repeated exposure (Globally Harmonized System) no data available
Potential health effects (toluene):	May be harmful if inhaled. Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness.
Inhalation Ingestion (toluene):	May be harmful if swallowed. Aspiration hazard if swallowed - can enter lungs and cause damage.
Skin Eyes (toluene):	May be harmful if absorbed through skin. Causes skin irritation. Causes eye irritation.
Signs and Symptoms of Exposure (toluene):	Lung irritation, chest pain, pulmonary edema, Inhalation studies on toluene have demonstrated the development of inflammatory and ulcerous lesions of the penis, prepuce, and scrotum in animals.
Additional Information (toluene):	RTECS: XS5250000

(12) ECOLOGICAL INFORMATION (TOLUENE)

Toxicity to fish:	LC50 - Oncorhynchus mykiss (rainbow trout) - 7.63 mg/l - 96 h NOEC - Pimephales promelas (fathead minnow) - 5.44 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 8.00 mg/l - 24 h Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h
Toxicity to algae:	EC50 - Chlorella vulgaris (Fresh water algae) - 245.00 mg/l - 24 h EC50 - Pseudokirchneriella subcapitata (green algae) - 10.00 mg/l - 24 h
Persistence and degradability:	Biodegradability Result: - Readily biodegradable. Bioaccumulative potential: no data available. Mobility in soil no data available PBT and vPvB assessment: no data available
Other adverse effects:	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Toxic to aquatic life.

(13) DISPOSAL CONSIDERATIONS

Product:	Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and nonrecyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.
Contaminated Packaging:	Dispose of as unused product.

(14) TRANSPORT INFORMATION

DOT (US)	UN number: 1294 Class: 3 Packing group: II Proper shipping name: Toluene Reportable Quantity (RQ): 1000 lbs Marine pollutant: No Poison Inhalation Hazard: No
IMDG	UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D Proper shipping name: TOLUENE Marine pollutant: No
IATA	UN number: 1294 Class: 3 Packing group: II Proper shipping name: Toluene

(15) REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

(16) OTHER INFORMATION

Hazard statement(s)

H225 Highly flammable liquid and vapor.
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Disclaimer:

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user.

All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The information contained herein was not obtained from toxicology assays using our single-wall carbon nanotubes but gathered from literature.